EL-2

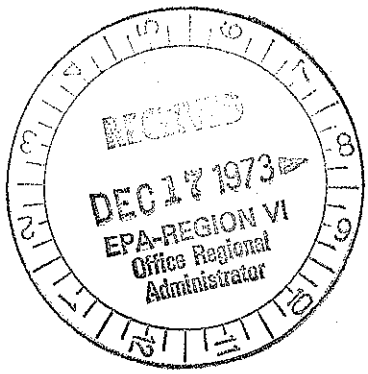
CC: Mr. Mark Chandler
Environmental Protection Agency
Dallas, Texas

E. I. DU PONT DE NEMOURS & COMPANY
INCORPORATED

PONTCHARTRAIN WORKS
P. O. BOX 2000, LAPLACE, LA. 70068

ELASTOMER CHEMICALS DEPARTMENT

December 14, 1973



Mr. Arthur W. Bush
Regional Administrator, Region VI
Environmental Protection Agency
1600 Patterson, Suite 1100
Dallas, Texas 75201

Marine Protection, Research & Santuaries Act
(Ocean Dumping) Permit No. 730D005
E. I. du Pont de Nemours and Company
Pontchartrain Works - La Place, La.

Dear Sir:

The following report is hereby submitted to comply with General Condition #10 of Ocean Dumping Permit No. 730D005. This report summarizes the disposal activities and the special impact studies required by the permit.

Drummed waste was disposed, under permit conditions, on three occasions in the past six months; on June 29, on August 30, and on October 30, 1973. Summaries of the data and records were compiled and forwarded to you, within 48 hours of completion of each dumping operation, in accordance with General Condition #7 of the permit. Copies of these summaries are attached in Appendices I, II, and III. Incidently, included in these reports are the heavy metal data requested under Special Condition #7 of the permit.

Special impact studies were initiated, under Special Condition #6, to determine the temporary and permanent effect of dumping on the disposal zone. The results of these studies are summarized and attached in Appendix IV. Briefly----"These studies show no evidence of long or short-term effects due to dumping, nor do they show any definitive pattern that bioaccumulation has been greater within the dumping area than outside."

Both the dumping activities and the special studies were performed, to the best of our ability, in accordance with the conditions of Permit No. 730D005. If any further information is requested, please contact me at your convenience.

Sincerely,

B. F. Harvey

B. F. HARVEY
ENVIRONMENTAL CONTROL OFFICER

RECEIVED
DEC 18 1973
6AEP

BFH:rb
attachments

EXHIBIT I

BCC: H. W. Burns
M. S. Deak
J. A. Hajek
H. W. Peckhaus
J. B. Robinson
R. A. Schulze - Wilm.
D. B. Sebree - Wilm.
B. L. Sutphen

June 30, 1973

Mr. Arthur W. Bush
Regional Administrator
Environmental Protection Agency
Region VI
1600 Patterson, Suite 1100
Dallas, Texas 75201

Dear Sir:

In accordance with Permit No. 730D005, granted to the Du Pont Company, Pontchartrain Works, La Place, La., on May 22, 1973, you are hereby notified that the Company on June 29, 1973, did dispose of 528 drums of Waste No. 1 in the Gulf of Mexico. This disposal was made in accordance with the General and Special Conditions of the Permit.

The facilities of the Chemical Waste Disposal Co., Lockport, La., were used for this disposal, namely, the tug Jim Lytal Registry No. 501927 and the barge Magnolia I Registry No. 259016.

The amount and analysis of this waste are shown in the attached table.

The position and times of dumping on May 29, 1973, are as follows:

	Greenwich Mean Time	Latitude	Longitude
Start of dumping	1140 Hrs.	28° 19 Min.	89° 20 Min.
Mid Point of dumping	1430 Hrs.	28° 02 Min.	89° 17 Min.
End of dumping	1645 Hrs.	28° 15 Min.	89° 25 Min.

Total time of disposal - Approx. 5 hours

The fathometer records of the disposal operation are attached.

This will certify that this disposal operation was done in accordance with the General and Special Conditions of Permit No. 730D005 to the best of our ability.

Sincerely,

B. F. HARVEY
ENVIRONMENTAL CONTROL OFFICER
E. I. DU PONT DE NEMOURS & CO.
LA PLACE, LOUISIANA

CHEMICAL WASTE DISPOSAL CO.
LOCKPORT, LA.
George G. Bollinger

BFH:rb
attachment

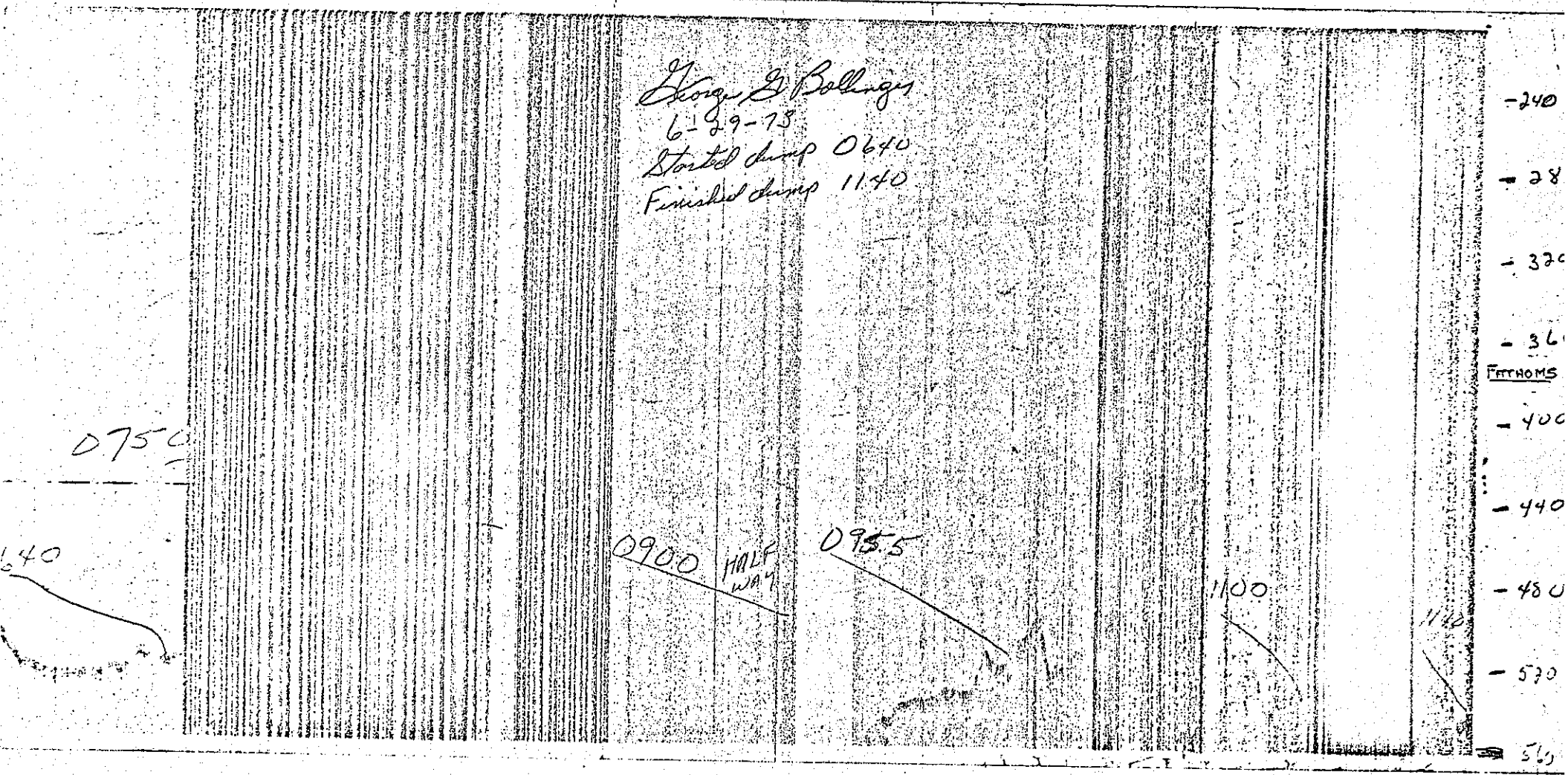
OCEAN DISPOSAL - JUNE, 1973

WASTE NO. 1 - AMOUNTS AND ANALYSES

Total Weight of Shipment	309,691 lbs.
Wt. of 528 drums (D.O.T. Spec. 37M)	21,120 lbs.
Wt. of ballast (pea gravel)	31,680 lbs.
Net wt. of Waste No. 1	256,891 lbs.

Gross Analyses of Waste	Percentage %	Net Lbs.
CuCl	0.24	616
Solids	0.56	1,438
High Boilers	17.85	45,855
Dichlorobutene	66.66	171,243
Quaternary Ammonia Salt	0.71	1,824

Metal Analyses	Parts/Million	Net Lbs.
Arsenic	4.0	1.0
Beryllium	<0.5	<0.1
Cadmium	<0.1	<0.02
Chromium	9.0	2.3
Copper	10,980	2,820
Nickel	28.0	7.2
Mercury	6.9	1.8
Selenium	<25.	<6.5
Lead	0.8	0.2
Vanadium	<2.0	<0.5
Zinc	2.5	0.6


George B Bollings
6-29-75
Started dump 0640
Finished dump 1140
0750
0900 HALF WAY
0955
1100
1140
-240
-28
-32
-36
FATHOMS
-400
-440
-480
-520

DISPOSAL 528 DRUMS - JUNE 29, 1973

APPROXIMATE ROUTE IN DISPOSAL ZONE

DRUMS DUMPED ONE PER 30 SECONDS

(SPEED APPROX. 13 MPH - DISTANCE BETWEEN DRUMS 572 FT.)

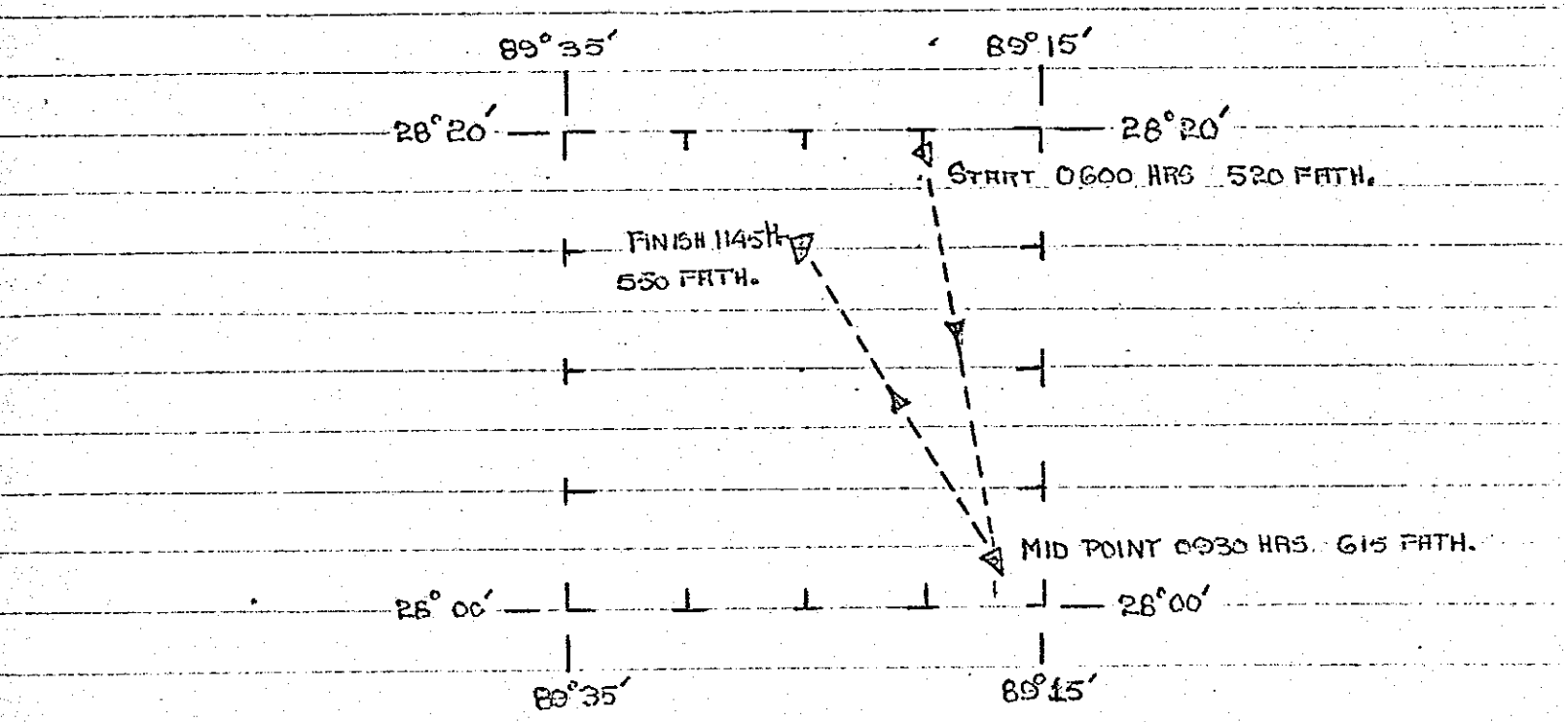


EXHIBIT II

EL-238

E. I. DU PONT DE NEMOURS & COMPANY
INCORPORATED
PONTCHARTRAIN WORKS
P. O. BOX 2000, LAPLACE, LA. 70068

ELASTOMER CHEMICALS DEPARTMENT

August 31, 1973

Mr. Arthur W. Bush
Regional Administrator
Environmental Protection Agency
Region VI
1600 Patterson, Suite 1100
Dallas, Texas 75201

E. I. DU PONT DE NEMOURS & COMPANY
PONTCHARTRAIN WORKS
LA PLACE, LA.
OCEAN DISPOSAL PERMIT NO. 730D005

Dear Sir:

In accordance with Ocean Disposal Permit No. 730D005, granted to the E. I. du Pont de Nemours & Company, Pontchartrain Works, La Place, La., on May 22, 1973, you are hereby notified that the Company on August 30, 1973, did dispose of 347 drums of Waste No. 1 and 162 drums of Waste No. 2 in the Gulf of Mexico. This disposal was made in accordance with the General and Special Conditions of the Permit.

The facilities of the Chemical Waste Disposal Co., Lockport, La., were used for this disposal; namely, the tug Jim Lytal Registry No. 501927 and the barge Magnolia I Registry No. 259016.

The amounts and analyses of these wastes are shown in the attached tables.

The position and times of dumping on August 30, 1973 are as follows:

	Greenwich Mean Time	Latitude	Longitude
Start of dumping	1215 Hrs.	28° 15 Min.	89° 20 Min.
Mid Point of dumping	1400 Hrs.	28° 13 Min.	89° 31 Min.
End of dumping	1630 Hrs.	28° 16 Min.	89° 32 Min.

Total time of disposal - Approx. 4.25 hours

The fathometer records of the disposal operation are attached.

This will certify that this disposal operation was done in accordance with the General and Special Conditions of Permit No. 730D005 to the best of our ability.

Sincerely,

B. F. Harvey

B. F. HARVEY
ENVIRONMENTAL CONTROL OFFICER
E. I. DU PONT DE NEMOURS & CO.
LA PLACE, LA.

George G. Bollinger

GEORGE G. BOLLINGER
CHEMICAL WASTE DISPOSAL CO.
LOCKPORT, LA.

BFH:rb
attachments

TABLE I
OCEAN DISPOSAL - AUGUST 30, 1973
WASTE NO. 1 - AMOUNTS AND ANALYSES

Total Weight of Waste No. 1 Shipment	198,513 lbs.
Weight of 349 drums (DOT Spec. 37M)	13,960 lbs.
Weight of ballast (pea gravel)	20,940 lbs.
Net Weight of Waste No. 1	163,613 lbs.

Gross Analyses of Waste	Percentage	Net Lbs.
CuCl	0.34	556
Solids	1.92	3,141
High Boilers	24.87	40,690
Dichlorobutene	61.96	101,375
Quaternary Ammonia Salt	1.61	2,634

Metal Analyses	Parts per Million	Net Lbs.
Arsenic	3.0	0.5
Beryllium	<0.2	<0.03
Cadmium	<0.02	<0.003
Chromium	1.5	0.25
Copper	1305	213
Nickel	4.2	0.7
Mercury	<0.01	<0.0015
Selenium	<20	<3.3
Lead	104	17
Vanadium	<0.5	<0.08
Zinc	0.6	0.10

TABLE II

OCEAN DISPOSAL - AUGUST 30, 1973

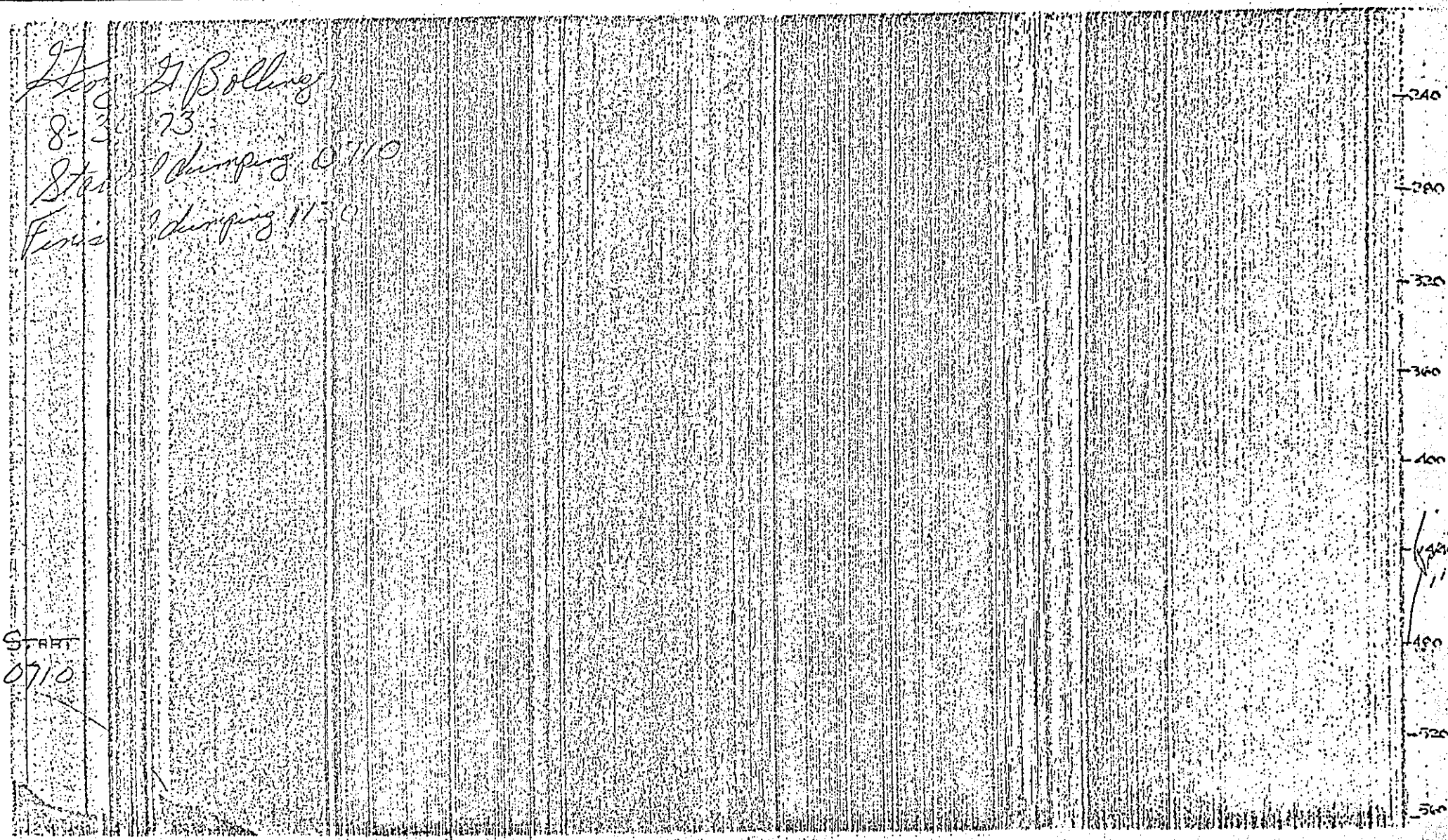
WASTE NO. 2 - AMOUNTS AND ANALYSES

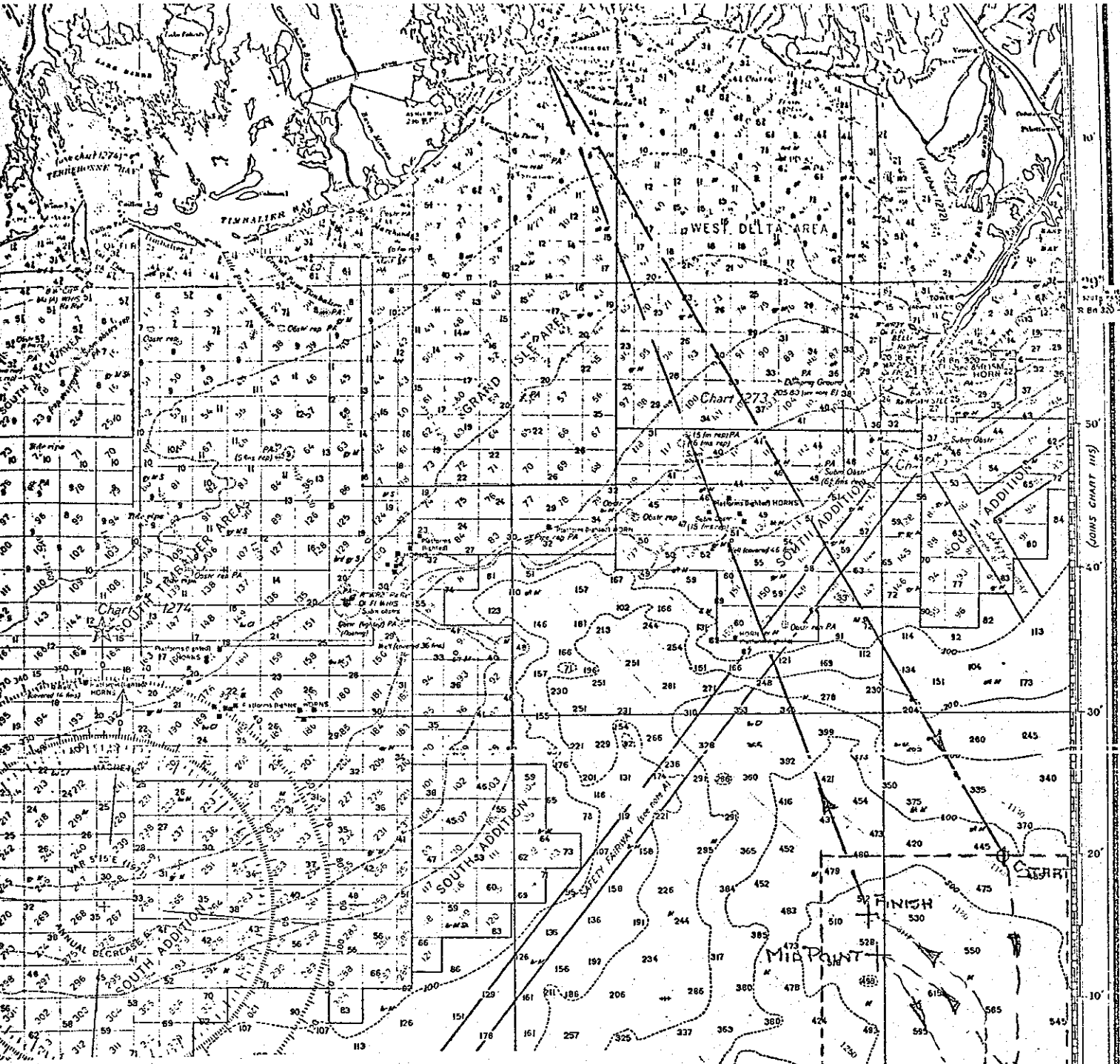
Total Weight of Waste No. 2 Shipment.....	90,146 lbs.
Weight of 162 drums (DOT Spec. 17C).....	10,044 lbs.
Weight of Ballast (pea gravel).....	40,632 lbs.
Net Weight of Waste No. 2.....	39,470 lbs.

Gross Analyses of Waste	Percentage	Net Lbs.
Dry Solids	89.2	35,207
High Boilers	9.9	3,907
Toluene	0.9	355

Metals Analyses	Parts per Million	Net Lbs.
Arsenic	<2.0	<0.08
Beryllium	<0.2	<0.008
Cadmium	<0.04	<0.0001
Chromium	3.0	0.12
Copper	24.4	0.96
Nickel	1070.	42.2
Mercury	0.12	0.005
Selenium	26	1.0
Lead	19.2	0.76
Vanadium	<0.5	<0.02
Zinc	12.4	0.49

FATHOMETER RECORD
DRUM DISPOSAL - AUGUST 30, 1973





DRUM DISPOSAL - AUGUST 30, 1973

509 DRUMS

APPROX. COURSE: SHOWN

DUMP RATE: ONE DRUM PER 30 SEC.

BARGE SPEED: 12 to 13 MPH

DISTANCE BETWEEN DRUMS: 528 TO 572 FT.

EXHIBIT III

October 20, 1973

Mr. Arthur W. Bush
Regional Administrator
Environmental Protection Agency
Region VI
1600 Patterson, Suite 1100
Dallas, Texas 75201

E. I. DU PONT DE NEMOURS & COMPANY
PONTCHARTRAIN WORKS
LA PLACE, LA.
OCEAN DISPOSAL PERMIT NO. 730D005

Dear Sir:

In accordance with Ocean Disposal Permit No. 730D005, granted to the E. I. du Pont de Nemours & Company, Pontchartrain Works, La Place, La., on May 22, 1973, you are hereby notified that the Company on October 20, 1973, did dispose of 333 drums of Waste No. 1 in the Gulf of Mexico. This disposal was made in accordance with the General and Special Conditions of the Permit.

The facilities of the Chemical Waste Disposal Co., Lockport, La., were used for this disposal; namely, the tug Jim Lytal Registry No. 501927 and the barge Magnolia I Registry No. 259016.

The amounts and analyses of these wastes are shown in the attached tables.

The position and times of dumping on October 20, 1973, are as follows:

	Greenwich Mean Time	Latitude	Longitude
Start of dumping	1415Z (0915)	28° 15 min.	89° 25 min.
Mid Point of dumping	1545Z (0745)	28° 7 min.	89° 23 min.
End of dumping	1725Z (1125)	28° 13 min.	89° 22 min.

Total time of disposal - Approx. 3½ hours

The fathometer records of the disposal operation ~~are attached.~~ were not attainable due to excessively rough seas.

This will certify that this disposal operation was done in accordance with the General and Special Conditions of Permit No. 730D005 to the best of our ability.

Sincerely,

B. F. HARVEY
ENVIRONMENTAL CONTROL OFFICER
E. I. DU PONT DE NEMOURS & CO.
LA PLACE, LOUISIANA

BFH:rb
attachment

OCEAN DISPOSAL - OCTOBER 20, 1973
WASTE NO. 1 - AMOUNTS AND ANALYSES

Total	Weight of Waste No. 1 Shipment	196,021
	Weight of 333 drums (DOT Spec. 37M)	13,320
	Weight of ballast (pea gravel)	19,980
	Net Weight of Waste No. 1	162,721

Gross Analyses of Waste	Percentage	Net Lbs.
CuCl	0.50	814
Solids	0.66	1074
High Boilers	15.37	25010
Dichlorobutene	72.65	118217

Metal Analyses	Parts per Million	Net Lbs.
Arsenic	1.7	0.28
Beryllium	<0.2	<0.03
Cadmium	<0.02	<0.003
Chromium	0.4	0.07
Copper	14656	2385
Lead	0.05	0.08
Mercury	<0.01	<0.002
Nickel	3.0	0.49
Selenium	<20	<3.3
Vanadium	<0.5	<0.08
Zinc	0.5	0.08

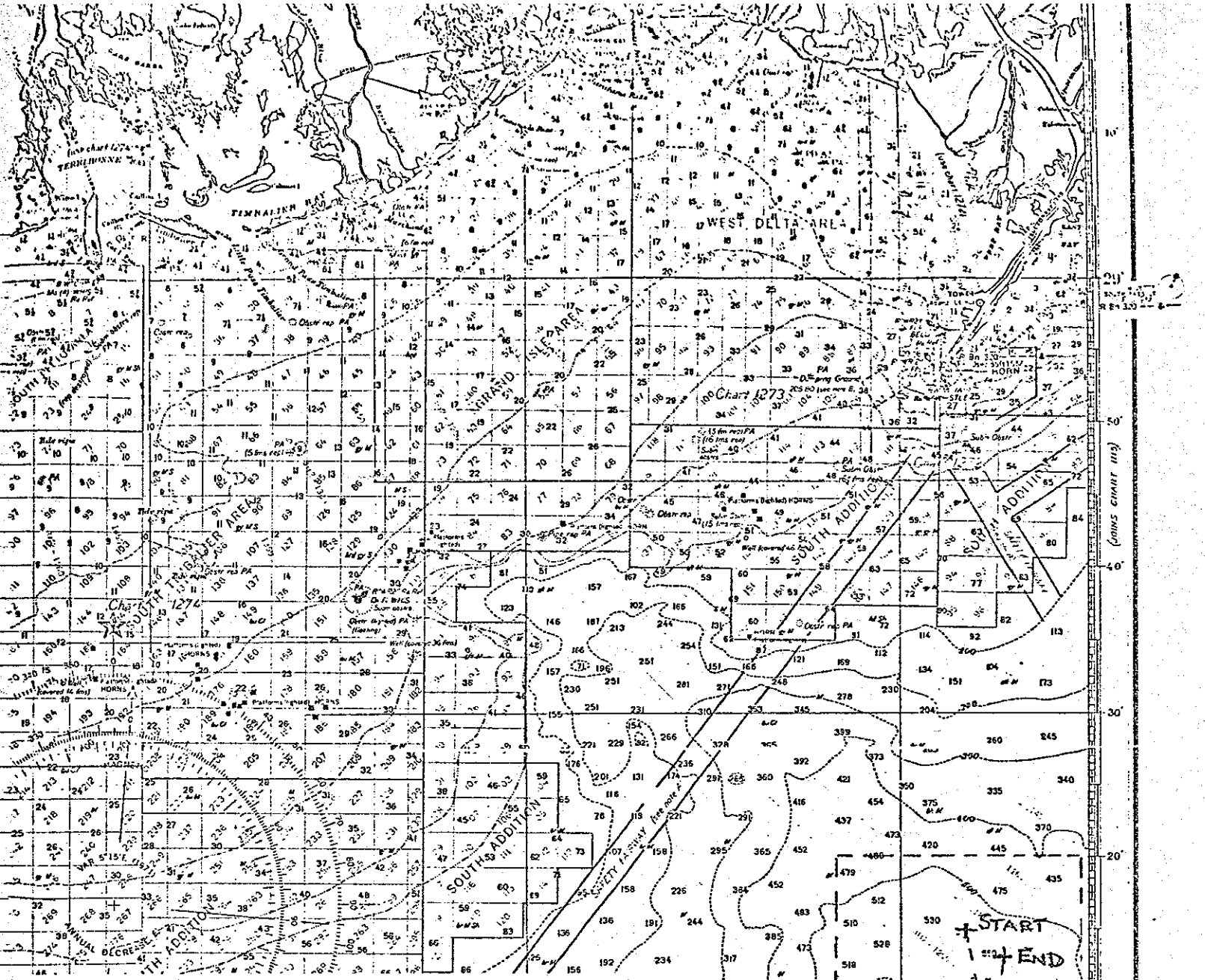

DRUM DISPOSAL - OCTOBER 20, 1973
333 DRUMS
DUMP RATE - ONE DRUM/35 SECONDS
BARGE SPEED - 12 MPH
DRUM SPACING - 528 - 618 FT.
START
END
MID-POINT
CAUTION
Oil well structures, some submerged and capped, and submerged cables are charted only where offshore of the outside limits of the 1200 series charts.
WEST DELTA AREA
GRAND ISLE AREA
SOUTH TIMBALIER AREA
SOUTH ADDITION
Chart 1273
Chart 1274

EXHIBIT IV

EXHIBIT IV: ENVIRONMENTAL DATA AND IMPACT

In accordance with Special Condition 6 of Permit No. 730D005, Du Pont initiated several programs, to determine the effects, both temporary and permanent, of ocean disposal of drummed waste. Bioassays have determined the toxicity limits of ocean disposal of drummed waste. Bioassays have determined the toxicity limits of wastes or waste components on the various types of marine life that would be expected to be found in the disposal zone. The integrity of the drums as they sink to the ocean floor was examined; both, by theoretical stress calculations showing the effect of ever-increasing hydrostatic press on the drums and by lowering several drums to the ocean floor - then retrieving them for examination. The bioaccumulation of wastes in the food chain was determined by sampling the muds and marine life on the ocean floor and then examining them for waste accumulation.

- Bioassay Program

This program was conducted by the Department of Limnology, Academy of Natural Sciences, Philadelphia, Dr. Ruth Patrick, Chairman. Several species of marine life, representative of that on the sea bottom, were selected after consultation with and with the concurrence of Dr. Juhl of the National Marine Fisheries Laboratory at Pascagoula, Mississippi. The species agreed on were a fish (croaker) (leiostomer xanthurus), a blue craw crab (callinectus sapidus and a grass shrimp (palocomonetes pugio).

Bioassays were made on 1,4 dichlorobutene-2 (DCB), on hydrolyzed DCB, on Waste #1 (copper extracted) and on Waste #10. These test materials were selected during a conference between EPA and Du Pont personnel at Dallas, Texas on June 7, 1973. The results of these bioassays are shown in Table I. Previous toxicity data for blue gill fish, reported in the permit application March 26, 1973, are also listed for comparison.

TABLE I

Material	Toxicity Data TL_M - 96 Hr. PPM			
	Crab	Shrimp	Croaker	Bluegill
1,4-dichlorobutene	0.43	0.20	0.30	0.42
Hydrolyzed 1,4-dichlorobutene	534.	1780.	107.	108.
3,4-dichlorobutene	-	-	-	97.
Hydrolyzed 3,4-dichlorobutene	-	-	-	51.
Chlorobutadiene	-	-	-	234.
Adiponitrile	-	-	-	720.
Waste #1 (copper extracted)	0.54	0.267	0.33	-
Waste #10	395.	258.	202.	-

EXHIBIT IV (Cont'd)

- In Situ Dispersion - Program - Stress Analyses of Drums

In accordance with Special Condition 6b(ii) of Permit No. 730D005 and after consultation with EPA Personnel Region VI, it was agreed that the in situ dispersion characteristics of drummed waste depended primarily on the integrity of the drum as it reached the ocean bottom. Further, it was agreed that the effect of ever increasing hydrostatic pressure would be examined by calculating the stresses on the drum ends and walls necessary to cause buckling and collapse.

Three types of drums are used for waste disposal as specified by Department of Transport (DOT) regulations. In general, a 55 gallon open head (removable head) is used for contaminated solids, a 55 gallon tight head (two bungs in head) is used for contaminated liquids and a 55 gallon open head with an inside polyethylene liner is used for corrosive liquids. All drums have either 16 gauge (0.0598 in.) or 24 gauge (0.0239 in.) heads and walls. For purpose of calculation, the drums were assumed to be filled to within one to two inches of the top with waste material - this is the normal fill level.

Calculations show that the convexity of the heads will reverse itself and the heads and chimes will begin to yield when the differential external pressure is 0.8 psi for a 24-gauge head. The body will collapse in compression and buckling when the differential external pressure is 8.0 psi for a 24-gauge head. Therefore, one can expect deformation and buckling before the differential external pressure reaches 20 psi; that is, before the drum is immersed in 45 feet of sea water (SG 1.020).

Consider now the case of the 55-gallon open head drum with the polyethylene liner. This liner is an integral polyethylene piece complete with bungs. During assemble, it slides into the drum so smugly that weep holes are provided in the base of the drum to release the air trapped in the bottom.

When this drum sinks, the water will penetrate the weep holes in the base of the drum and around the bung connections into the annular space between the wall of the drum and the polyethylene liner. The pressure on the drum will be equalized as it sinks and the polyethylene liner will be subjected to the external water pressure. This liner can readily withstand deformation of more than 10% volume and is not expected to be structurally damaged as it sinks to 600 fathoms.

- In Situ Dispersion Program - Drum Immersion Test

In order to confirm the predictions of the stress calculations, Du Pont conducted a test in which one of each of the three types of drums were loaded with simulated wastes, lowered to the ocean floor, retrieved and examined. Each of these drums were loaded with simulated waste; that is, water was substituted for toxic liquids, coal was substituted for contaminated coke. The test was made at position 28° 16 min. latitude, 89° 32 min. longitude in approximately 515 fathoms (3090 feet) of water. Each drum was lowered at approximately 200 feet per min. and retrieved at approximately 150 feet per min.

The 55 gallon tight head drum was retrieved completely undamaged. Initially, it was thought that the drum was inadvertently completely filled with liquid - re-examination later confirmed that there was about one inch air space above the liquid. Further, the water in the drum analyzed 82 ppm NaCl indicating no gross inward leakage of sea water. Photographs of the drum are shown in Figure I.

The 55 gallon open head drum was retrieved severely crumpled on the sides and dished on the bottom. The simulated waste of pea gravel (ballast) and coal was dry indicating no inward leakage of sea water. The head was squeezed on so tightly it had to be pried off. Photographs of this drum are shown in Figure II.

The 55 gallon open head with the polyethylene liner was retrieved with the top lid showing only a slight wrinkle, otherwise there was no damage to the body or bottom. The polyethylene liner was intact and the water in this liner analyzed 90 ppm NaCl indicating no gross inward leakage of sea water. Photographs of this drum are shown in Figure III.

- In Situ Dispersion - Drum Integrity

The preceding stress analysis and immersion test would indicate that the drums can buckle and crumple as they sink but probably they do not split open or spring leaks. Thus, it would appear that in situ dispersion of the wastes and hence their effect on the marien environment would be dependent not on exposure of the complete drum contents to the ocean floor but rather to gradual corrosion of the drum surfaces with diffusion of the contents from the corroded areas of the drum. Corrosion rates for completely immersed steel at low (4°C - 5°C) temperatures are less than 0.005 inches per year; expected drum life would be five to ten years.

- In Situ Dispersion - Drum Integrity (Cont'd)

Dichlorobutenes under these conditions can be expected to be completely hydrolyzed to less toxic materials in this period of time. Waste No. 1, which is initially 95% dichlorobutene, also dehydrochlorinates and polymerization occurs; thus the dichlorobutene will gradually disappear and be replaced with low molecular weight polymers. In addition, Waste No. 1 is in the polyethylene lined drums - the liners would remain intact after the drum had corroded away, leaving a liner with essentially low molecular weight polymers and copper salts.

- Bioaccumulation Program

In accordance with Special Condition 6b(iii) Permit No. 730D005 and after consultation with EPA Region VI, it was agreed that this program would consist of sampling the bottom muds and marine life and analyses for waste components. This program was conducted for Du Pont under the auspices of the Department of Limnology, Academy of Natural Sciences, Philadelphia, Dr. Ruth Patrick, Chairman.

Several samples were taken in the dump zone and one was taken approximately 30 miles southwest - the latter was for control (see Attachment K-4 for location). The attached report from the Academy of Natural Sciences (see Attachment K-5) summarizes the details and the results of this program. In brief, it was found "---no definite pattern of copper concentration in organisms or mud was discernible between the dumping area and areas outside it." As part of the assessment of bioaccumulation of waste, Du Pont analyzed aliquots of the same samples of mud and biota obtained by the Academy of Natural Science for major waste components. These analyses were made by gas chromatography with an estimated sensitivity for dichlorobutenes of 10 ppb. None of the samples showed any trace of waste components or of any other organics.

In summary------"These studies show no evidence of long-term or short-term effects due to dumping, nor do they show any definitive pattern that bioaccumulation has been greater within the dumping area than outside."

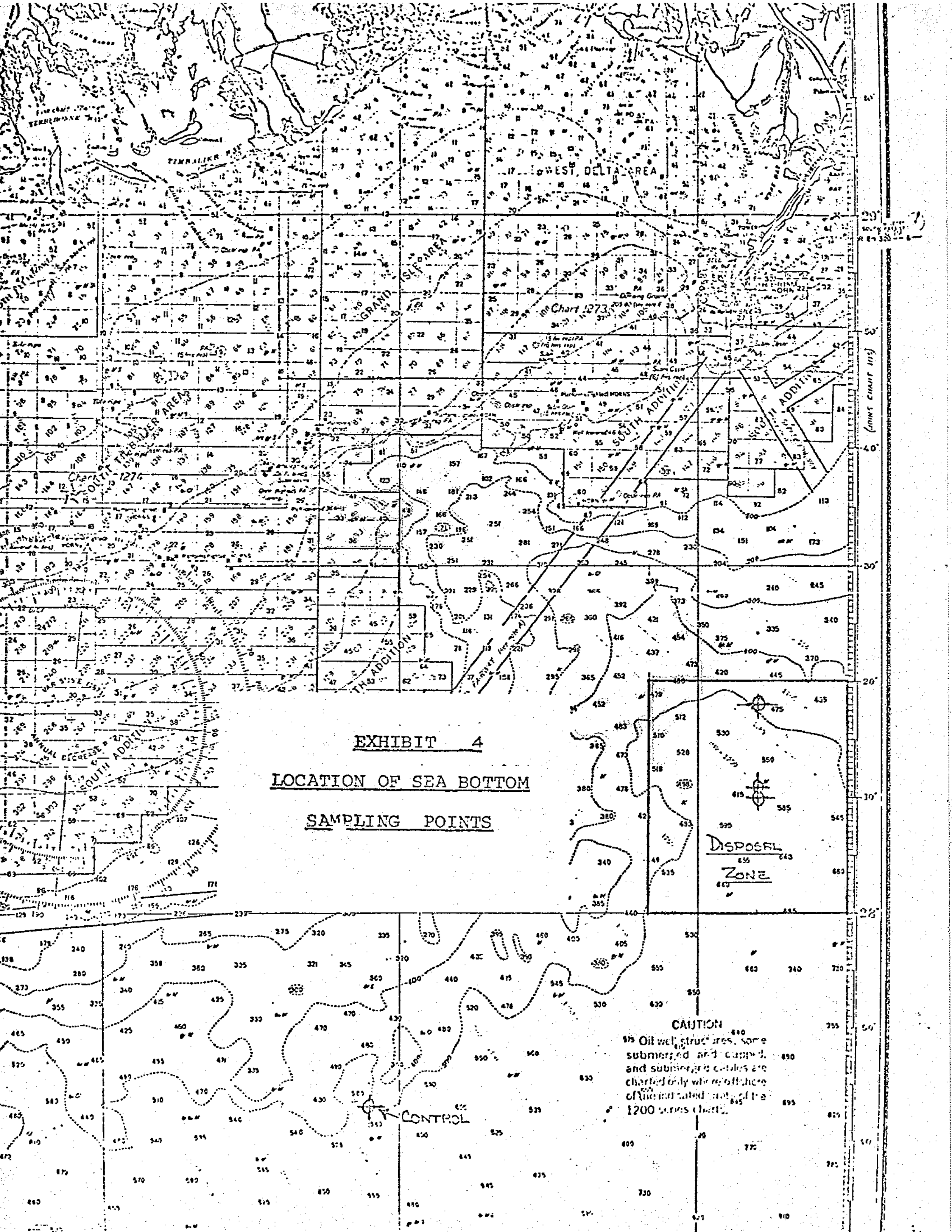


EXHIBIT 4

LOCATION OF SEA BOTTOM SAMPLING POINTS

THE ACADEMY OF NATURAL SCIENCES

NINETEENTH AND THE PARKWAY, PHILADELPHIA, PENNSYLVANIA 19103 Phone LO 4-3921 Area Code 215

September 28, 1973

Mr. Bruce F. Harvey
Environmental Control Officer
Pontchartrain Works
E. I. du Pont de Nemours & Co.
P.O. Box 2000
LaPlace, Louisiana

Dear Mr. Harvey:

At your request, benthic samples were collected in the Gulf of Mexico within and outside the area used for waste disposal. These samples were collected between August 9 and 12, 1973, by Dr. David Grant and Mr. Charles Powell--working from a ship owned by the Bollinger and Boyd Barge Service, Inc., of Lockport, Louisiana. Collections were made with an anchor dredge and an epibenthic sled.

Samples taken within the disposal area were as follows:

28° 10'N; 89°24'W (sample AD-1)
28° 11'N; 89°24'W (sample EP-4)
28° 18'N; 89°24'W (sample EP-6)

Samples taken outside the disposal area were as follows:

Southwest of Area
27° 43'N; 90°03'W (samples EP-1 and EP-2)

Subsequently the samples were frozen, taken to our laboratory in Philadelphia, and analyzed for copper using atomic absorption spectroscopy. The analyses were carried out by Mr. John Coles.

The results of these analyses are appended in Tables 1 - 3.

Mud analyses showed large variations in copper content between samples, both within the dumping area and outside of it (see Table 3 for comparisons). There appeared to be no significant differences between copper content of mud outside the dumping area and within it. Differences noted were probably related to the amount of silt in the particular samples analyzed.

With regard to the living material studied, the greatest amount of variance appears to be correlated with the type of organism. This was shown where similar organisms were found inside and outside the dumping area.

For example, Cu content of worm tubes outside the dumping area varied from 8.0 to 8.2 µg/g (average 8.1 µg/g); within the dumping area these varied between 5.1 and 26.1 µg/g (average 17.5 µg/g).

On the other hand, annelid worms (Polychaeta) ranged from 19.1 to 24.6 µg/g Cu (average 21.8 µg/g) within the dumping area; 30 µg/g outside the area. Bivalve mollusks ranged from 7.3 to 10.7 µg/g (average 9.3 µg/g) within the dumping area; 8.8 to 12.9 µg/g (average 10.7 µg/g) outside the dumping area.

Thus no definite pattern of copper concentration in organisms or mud was discernable between the dumping area and areas outside it. These studies show no evidence of long-term or short-term effects due to dumping, nor do they show any definite pattern that bioaccumulation has been greater within the dumping area than outside.

Yours sincerely,

Bill

C. W. Hart, Jr.
Director of Consulting Programs
Limnology Department

CWH:msq
Enc.

TABLE 1. - Copper (Cu) content of certain organisms and mud collected within dumping area in Gulf of Mexico between August 9 and 12, 1972.

Material	Cu content µg/g dry wt.	Location	Sample Designation
annelid worms	24.6	28°10'N; 89°24'W	AD-1
annelid worms	19.1	28°10'N; 89°24'W	AD-1
worm tubes	26.1	28°10'N; 89°24'W	AD-1
worm tubes	5.1	28°10'N; 89°24'W	EP-1
worm tubes	14.3	28°18'N; 89°24'W	EP-6
worm tubes	24.3	28°18'N; 89°24'W	EP-6
starfish	53.3	28°18'N; 89°24'W	EP-6
starfish, crab, and worm	26.7	28°18'N; 89°24'W	EP-6
sea cucumber	20.8	28°10'N; 89°24'W	AD-1
sea cucumber	9.1	28°11'N; 89°24'W	EP-4
sea cucumber	9.6	28°18'N; 89°24'W	EP-6
bivalve mollusk	9.8	28°18'N; 89°24'W	EP-6
bivalve mollusk	10.7	28°18'N; 89°24'W	EP-6
bivalve mollusk	7.3	28°11'N; 89°24'W	EP-4
crab	23.9	28°10'N; 89°24'W	AD-1
fish	5.1	28°18'N; 89°24'W	EP-6
mud	22.4	28°10'N; 89°24'W	AD-1
mud	44.3	28°11'N; 89°24'W	EP-4
mud	29.7	28°11'N; 89°24'W	EP-4
mud	26.5	28°11'N; 89°24'W	EP-4
mud	65.5	28°11'N; 89°24'W	EP-4
mud	29.3	28°18'N; 89°24'W	EP-6
mud	26.5	28°18'N; 89°24'W	EP-6
mud	34.3	28°18'N; 89°24'W	EP-6

TABLE 2. - Copper (Cu) content of certain organisms and mud collected southwest of dumping area in Gulf of Mexico between August 9 and 12, 1973.

Material	Cu content µg/g dry wt.	Location	Sampling Designation
annelid worms	30.0	27°43'N; 90°03'W	EP-2
worm tubes	8.0	27°43'N; 90°03'W	EP-1
worm tubes	8.2	27°43'N; 90°03'W	EP-2
bivalve mollusks	12.9	27°43'N; 90°03'W	EP-1
bivalve mollusks	11.0	27°43'N; 90°03'W	EP-1
bivalve mollusks	11.1	27°43'N; 90°03'W	EP-2
bivalve mollusks	9.5	27°43'N; 90°03'W	EP-2
bivalve mollusks	8.8	27°43'N; 90°03'W	EP-1
snail	33.8	27°43'N; 90°03'W	EP-2
fish	4.9	27°43'N; 90°03'W	EP-1
mud	40.6	27°43'N; 90°03'W	EP-2
mud	32.5	27°43'N; 90°03'W	EP-2
mud	33.0	27°43'N; 90°03'W	EP-2
mud	29.3	27°43'N; 90°03'W	EP-2

TABLE 3. - Average copper (Cu) values in µg/g dry weight found in organisms and mud within and outside dumping area in Gulf of Mexico between August 9 and 12, 1973.

	Within Dump Area	Outside Dump Area
Annelid worms		
average	21.8	30.0
range	19.1 - 24.6	30.0
Worm tubes		
average	17.5	8.1
range	5.1 - 26.1	8.0 - 8.2
Mollusks		
average	9.3	10.7
range	7.3 - 10.7	8.8 - 12.9
All organisms		
average	18.1	13.8
range	5.1 - 26.1	4.9 - 33.8
Mud		
average	34.8	33.8
range	22.4 - 44.3	29.3 - 40.6

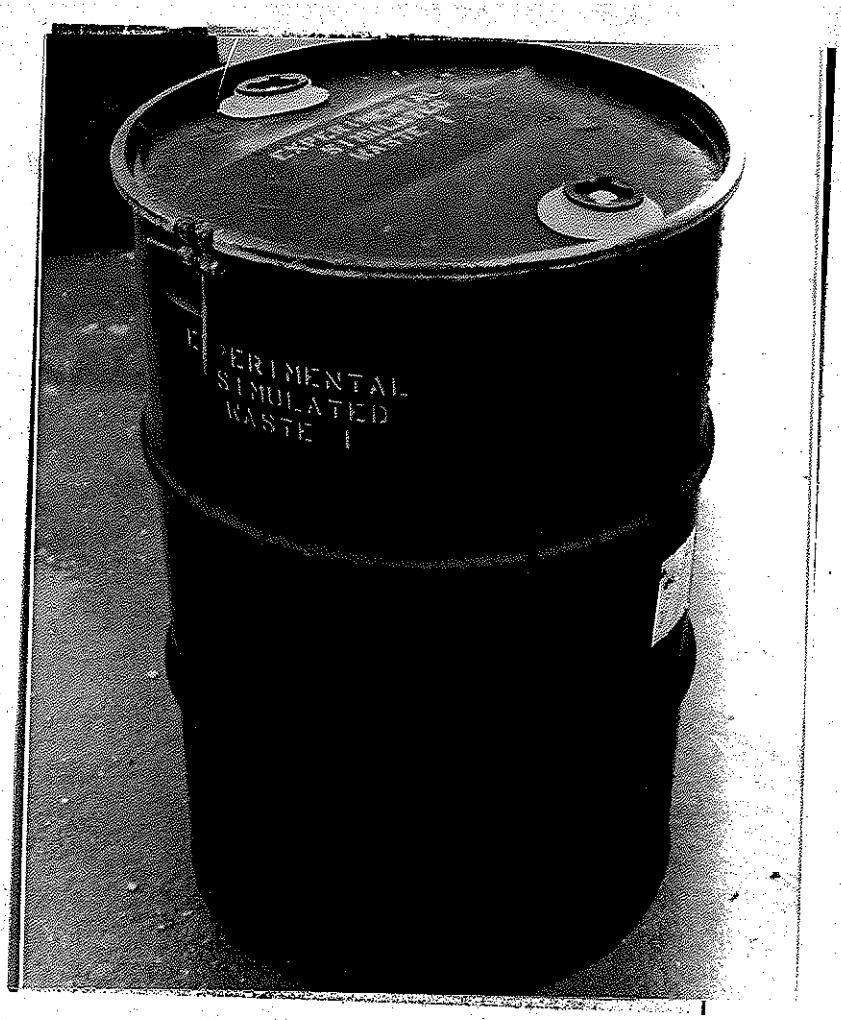


FIGURE III

DRUM IMMERSION TEST

(55 GAL. OPENHEAD WITH POLYETHYLENE LINER)

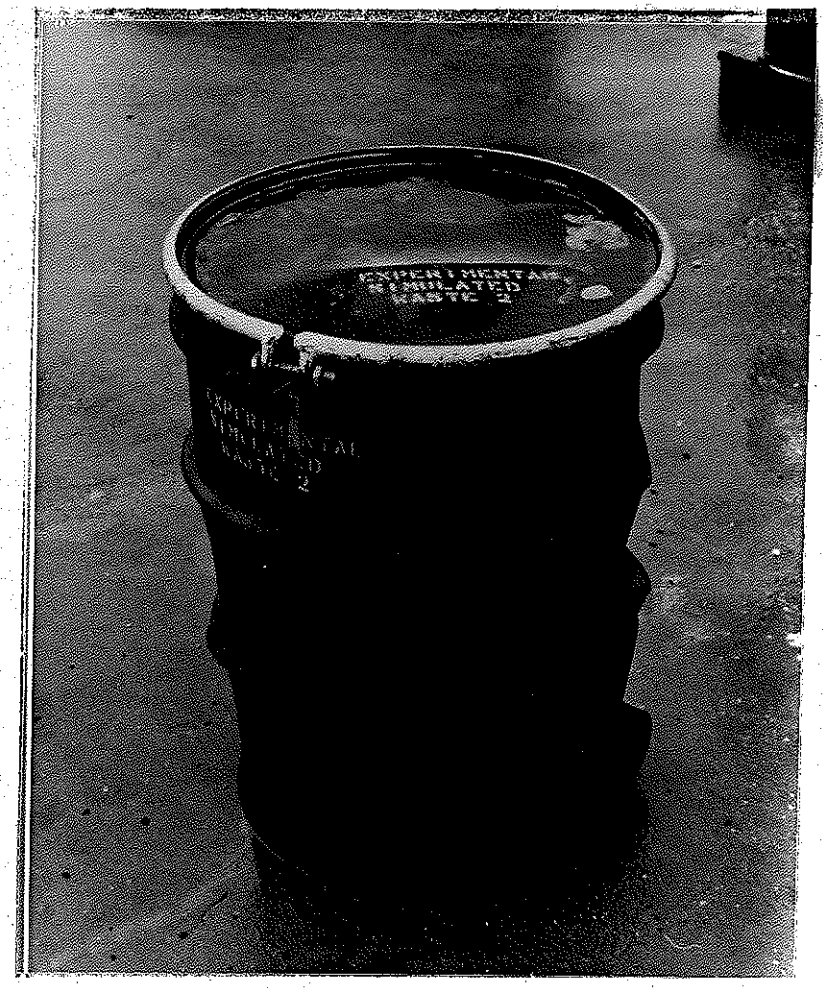


FIGURE II
DRUM IMMERSION TEST
(55 GAL. OPENHEAD)

FIGURE I

DRUM IMMERSION TEST
(55 GAL. TIGHTHEAD)